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Fifty-four 5-year-old Head Start children participated in a study of the effect of varied versus repeated training on the development of the ability to categorize and transfer learning. The children were grouped according to chronological age and results of a mastery test and the Peabody Picture Vocabulary Test. Work categories translated into single verbs, such as "sell" or "clean," were used in an instructional pattern involving two frames. The first frame contained a single stimulus picture of a specific kind of worker, and the second frame contained three pictures of different kinds of workers. After commentary, the children were asked to match the worker in frame one with the worker who was doing the same kind of work in frame two. Different instructional treatments involved number and variety of instances presented in these matching-to-sample tests. When the children's results on mastery, near-transfer, and far-transfer tests were compared, it was found that if the number of categories were held constant and if the instances were either varied or repeated, the children trained with greater variety rather than greater repetition were superior on the transfer to new instances test. There were no significant differences among groups on the other measures. (MS)

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EFFECT OF VARIETY ON THE LEARNING OF A SOCIAL STUDIES CONCEPT BY PRESCHOOL CHILDREN[1]

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The practical significance of this investigation lies in the application of learning theory to curriculum development. The theoretical question concerns the effects of varied versus repeated training on the development of the ability to categorize in preschool children. Practice in categorization, a task which children of this age appear to enjoy, significantly strengthens the growth of cognitive processes in the young child. It is the question of what kind of practice will produce the broadest effect which is of interest in the present investigation.

Each instructional treatment was evaluated for differential effects in facilitating performance on a task containing new information. In addition to the treatment effects, one would expect a certain amount of transfer as a result of a learning set which was developed by training in responding to pictures similar to the transfer pictures.

Reese (1958) states that transfer is the most important focus for educators and psychologists concerned with human learning. Classroom instruction cannot conceivably teach all the information that individuals require to be

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able to function effectively. The most valuable training, therefore, will be that which will transfer to the widest variety of new instances.

One variable studied to determine which learning experiences provide the most transfer has been that of varied versus repeated practice. Adams (1954), Mandler (1954, 1962), and Osler & Trautman (1961) have indicated repeated practice with a limited number of instances produces transfer on the basis of overlearning. On the other hand, Callantine and Warren (1955), Duncan (1958) Harlow (1951), and Podell (1963), have indicated that varied practice results in superior transfer.

In general, the research seems to indicate that an intermediate condition of variety is most effective (Morrisett and Hovland, 1959; Shore and Sechrest, 1961; Stern, 1964). The rationale behind this position is that enough consistency is maintained so that original learning can occur to teach the concept while enough variety is experienced to establish its range of application. New instances can then be more readily identified and learned than if a smaller variety had been presented; a large variety may be too diverse to establish the concept.

The present investigation was conducted to determine if the above general trend could be verified with preschool children from a low socioeconomic population, and on new content (i.e., a social studies unit which is interrelated in a way that is representative of curriculum units for the preschool age level).

Experimental Design and Treatments

The social studies concept of "work" was presented in terms of categories of workers and instances of these categories. Three treatment groups were exposed to different varieties of number of categories and number of instances in an attempt to determine the combination that most efficiently teaches the

concept of "work" in a generalizable way. By this it is meant that learning categories of "work" can facilitate both the classifying of new instances and also the learning of new categories. The relative effects of the following were isolated for comparison: 1. more new instances vs. repeated instances, and 2. more new categories vs. repeated instances.

Hypotheses

1. The major hypothesis is that children receiving a large variety of instances will demonstrate superior performance on the transfer to new instances test, compared to those trained on the same number of categories but with repetition on fewer instances.

2. Secondarily it is hypothesized that children trained with a low variety treatment, consisting of both a small variety of repeated instances and a small variety of categories, will demonstrate superior performance on the mastery test, compared to the children receiving the same small number of categories but twice as many instances.

3. Thirdly, it is hypothesized that the high variety treatment, in which children are trained with a low variety of instances but a high variety of categories, will demonstrate superior performance on the transfer to new categories test, compared to both the low and intermediate variety treatments.

Method

Subjects

The subjects were 54 Head Start children, five years of age in an urban environment. A stratified random assignment based upon a mastery test, the Peabody Picture Vocabulary Test, and Chronological Age, was used to group the children.

Program Description

Eight categories of work were established in such a way that each category name was a verb indicating the actual nature of the work category. Four were used as training categories, and new instances of these categories were used on the Near Transfer Test. The other four were used for the two types of Far Transfer Tests with two categories used for each type.

One half of the instructional program began with the categories, "Fix" and "Sell." The second half began with the categories, "Clean" and "Carry." The curriculum for the third treatment was composed of both sets of categories.

The instructional programs were based upon a two-frame pattern. The first frame had a single stimulus picture. The description provided by the experimenter provided a consistent rule that pointed up the relevant attributes of that category. The second frame had three pictures of workers and the commentary described the category that was relevant on the first frame. The child was required to produce the verbal label and mark the appropriate picture. (On the second instructional unit, the commentary for the second frame was only "mark the man who is doing the same kind of work as the last man.")

DAY	FRAME 1 (MODEL)	FRAME 2 (CHOICES)
1	grocer	grocer, pilot, car mechanic
2	(Mastery Mid-Test)	
3	ice cream man	maid, grocer, electrician

INSERT FIGURE 1 ABOUT HERE

During the two days of instruction the subjects were provided with feedback after making a response, and most subjects scored above 95% on two instructional booklets, each containing 24 frames.

Criterion Measures

The children were given three types of tests. The Mastery Test was administered both as a mid-test and as a post-test. The transfer tests consisted of a Transfer-to-New-Instances Test (Near Transfer), and a Transfer-to-New-Categories Test (Far Transfer). The four categories presented in the Far Transfer Test were: Serve, perform, heal, and design. The Mastery and Near Transfer Tests were matching-to-sample tests and contained eight frames. Several forms were constructed to secure counter-balancing. The test instructions were, "This man is doing a certain kind of work. Find someone here who does the same kind of work." A training booklet was administered first to teach the children the task of matching-to-sample. The Far Transfer Test consisted of two different tasks, and two different new categories were used in each task so that the total test was on four new categories. Part 1 was a matching-to-sample booklet. Part 2 was a card sort task. In both parts, a verbal description was presented of each of the new categories. The subject was instructed to indicate the worker who "does the same kind of work."

Results

By analysis of covariance the scores of the intermediate variety treatment were significantly higher ($p < .05$) on the Near Transfer Test thus supporting Hypothesis 1. No support was found for the two other hypotheses. Children in the three treatments scored approximately the same on the Mastery and Far Transfer Test. (See Tables 1 and 2)

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Discussion

No outstanding trend was demonstrated in this investigation in that no one training condition was superior on all three criterion measures: Mastery, Transfer to New Instances, and Transfer to New Categories. The one statistically significant finding substantiated the major hypothesis. When comparing the two treatments in which the number of categories was held constant and the instances either varied or repeated, the children trained with greater variety of instances were superior on the Transfer to New Instances Test, when compared to the children who received fewer instances, repeated.

The children who were trained with twice the number of categories had a somewhat more difficult task. However, their overall scores were not lower than the two treatments which held categories constant. Thus it is interesting to note that even with a considerable increase in variety, treatment three was able to perform on a level not significantly different from that of the other two groups.

Only two days of instruction were provided, with three days of testing. All subjects were exposed to exactly the same program on the first day, and then assigned to treatments on a stratified random basis. Therefore, any difference among treatments could only occur as a result of the second day of instruction.

Individual children were occasionally observed verbalizing category names as an aid in selecting the appropriate response. One example occurred

frequently in the second day's instructional booklet. The instructions for the first of the two-frame pattern were to say "fix" and "mark the man who fixes." Then the subject was instructed to turn the page and "mark the man who does the same kind of work as that man" (indicating the man on the last page). One boy mumbled to himself, "What an I looking for? Oh, yes, I'm looking for the man who fixes."

This study indicates that for preschool children from this population, an intermediate condition of variety in training better facilitates near transfer. This transfer occurs when children have been trained on a small number of categories and a large number of instances, and when the near transfer involves categorizing new instances of workers on the basis of the trained categories.

The implications of this study for teachers of preschool children are that two conditions seem to be necessary for training in categorization to result in the facilitation of transfer to new instances. Sufficient consistency in the presentation of instances is apparently required to teach the category itself. In addition, a sufficient variety in the presentation of instances seems to be necessary to provide an indication of the range of the category so that new instances can be recognized as also belonging to that category. Teachers need to determine for their specific curriculum what amount of variety will be sufficient to satisfy these two conditions.

To evaluate very carefully the differential effects of over-learning (repeated examples) versus variety (new examples) in facilitating the development of preschoolers' ability to categorize, further research should teach an extended program that consists of many concepts and that includes a variety of audio-visual techniques.

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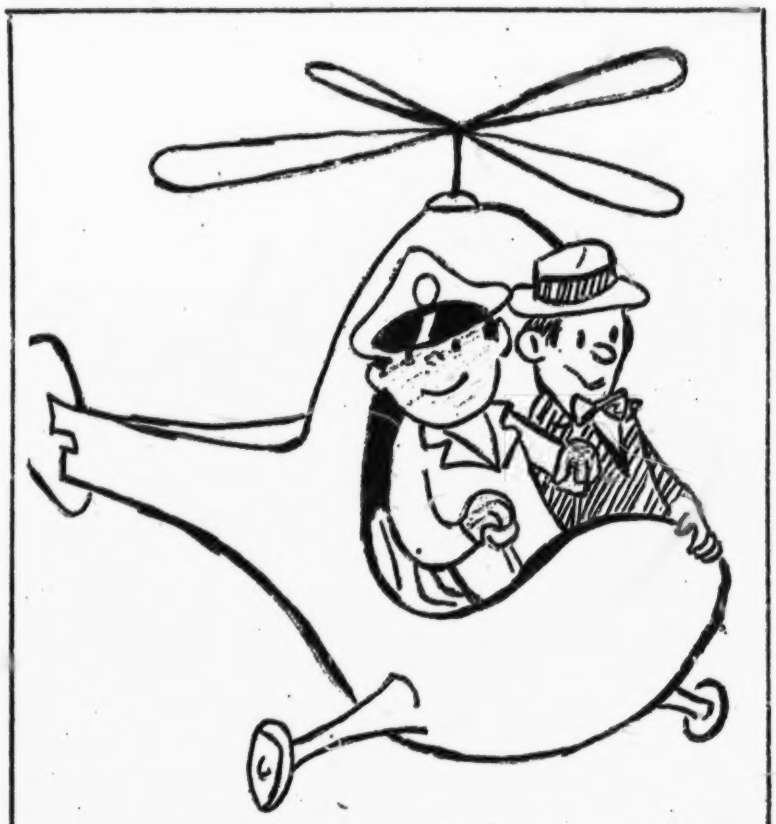
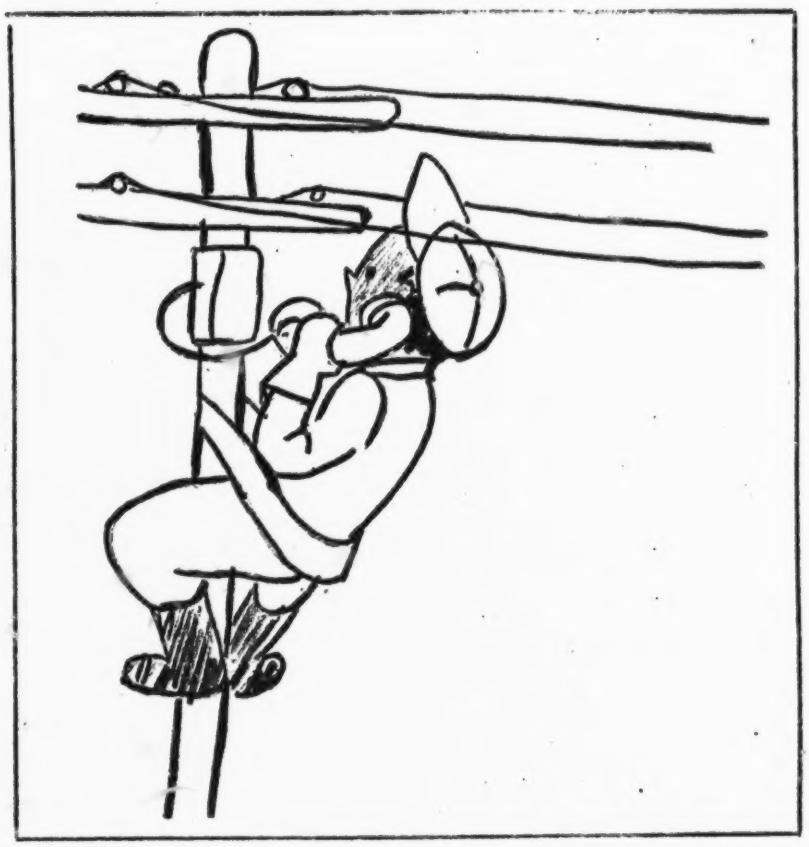


Stimulus 1



Stimulus 2

		Model	Three	Stimuli	Choice
Figure 1. Sample Instructional Frame	Day 1	2	1	2	4
(Matching-to-sample type of task)	Day 3	3	1	2	4

TABLE 1

MEANS AND STANDARD DEVIATIONS OF CRITERION MEASURES
AND MEANS OF THE TWO COVARIATES USED

	Dependent Variable										Covariates	
	Post-Test Mastery		Transfer to New Instances		Transfer to New Categories (booklet)		Transfer to New Categories (card-sort)		Transfer to New Categories (total)		Mid-Test	PPVT MA
Treatment												
Max correct	8		8		12		6		18		8	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	M
1A	6.1	1.60	3.2	1.48	4.6	1.78	4.4	1.71	9.0	2.36	4.7	46.0
1B	7.5	0.53	4.0	1.07	5.6	2.00	5.4	0.92	11.0	1.69	5.1	47.4
2A	5.7	2.06	4.9	1.27	4.8	2.05	4.0	2.00	8.8	3.31	4.6	45.9
2B	6.0	1.60	4.3	1.28	4.6	1.20	4.5	1.60	9.1	2.36	5.9	43.9
3AB	5.4	1.78	3.7	1.70	5.1	1.29	3.7	1.83	8.9	1.93	4.7	48.4
3BA	6.3	1.63	4.6	1.90	4.9	1.93	4.2	1.62	9.0	2.36	4.6	45.2

TABLE 2

SUMMARY OF ANALYSES OF COVARIANCE OF SCORES ON CRITERION MEASURES FOR TWO TREATMENTS BY TWO SETS OF CATEGORIES

		Dependent Variable									
		Post-Test Mastery		Transfer to New Instances		Transfer to New Categories (booklet)		Transfer to New Categories (card-sort)		Transfer to New Categories (total)	
Source	df	MS	F	MS	F	MS	F	MS	F	MS	F
Treatment (T)	1	7.12	2.95	8.47	5.92*	1.32	.40	1.68	.73	5.02	0.91
Category (C)	1	5.51	2.28	0.01	0.00	1.62	.49	7.70	3.35	18.06	3.26
T X C	1	2.04	0.84	4.19	2.93	2.66	.80	0.01	0.00	2.15	0.39
Error	29	2.42		1.43		3.33		2.30		5.54	

For each analysis the Mid-Test score and the PPVT-MA were used as covariates

* $p < .05$